IN THE UNITED STATES RECEIVING OFFICE

Applicant   :   Adobe Systems Incorporated
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Title   :   REDUCTION OF SEARCH AMBIGUITY WITH MULTIPLE MEDIA
                REFERENCES

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER ARTICLE 34

Before preliminary international examination, please amend claims 1, 3, 5-23, 25, 27-29, 31, 33-51, 53, and 55-59 as follows:

1.   A method for searching a collection of media objects, comprising:

combining ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information representing criteria for a search; and

comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects to identify one or more media objects ~~in the collection of media objects.~~<u>;</u>

<u>wherein a non-Euclidian function is used either to combine the information pertaining to the feature, or to compare the composite reference information to information pertaining to the same feature.</u>

3.   The method of claim 1, further comprising:

selecting a media object in the collection of media objects based upon the comparison of the ~~object~~ information <u>pertaining to the feature for each media object</u> and the composite reference information.

5.   The method of claim 4, wherein:

combining ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects includes combining ~~object~~ information for different types of objects.

6.   The method of claim 1, wherein:

combining ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information includes determining the intersection of the ~~object~~ information for the reference objects.

7.   The method of claim 1, wherein:

combining ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information includes determining the union of the ~~object~~ information for the reference objects.

8.   The method of claim 1, ~~wherein~~ <u>further comprising</u>:

<u>combining</u> ~~the object~~ information <u>pertaining to a second feature common to the plurality of reference objects</u> ~~characterizes features of the reference objects and the media objects in the collection of media objects~~ <u>to produce additional composite reference information representing criteria for the search; and</u>

<u>comparing the additional composite reference information to information pertaining to the second feature for each respective one of the plurality of media objects in the collection of media objects to identify one or more media objects.</u>

9. The method of claim 8, wherein:

the ~~object~~ information <u>pertaining to a feature and the information pertaining to a second feature</u> is weighted to specify a relative importance of the features. .

10. The method of claim 8, further comprising:

receiving user input indicating the relative importance of the features <u>and the second feature</u>.

11. The method of claim 8, wherein:

~~at least one~~ <u>the</u> feature <u>and the second feature are each</u> ~~is~~ represented by ~~the~~ <u>a</u> relative frequency of occurrence of <u>a feature value</u> ~~each of several values for the feature~~.

12. The method of claim 8, wherein:

<u>information pertaining to the feature and information pertaining to the second feature</u> ~~the set of features~~ includes color information describing the relative frequency of occurrence of colors in an object.

13. The method of claim 8, wherein:

~~a~~ <u>information pertaining to the</u> feature ~~for a first object type~~ is mapped to a <u>information pertaining to the second</u> feature ~~for a second object type~~.

14.   The method of claim 1, further comprising:

combining ~~object~~ information <u>pertaining to the feature</u> for an additional reference object with the composite reference information to revise the composite reference information.

15.   The method of claim 14, wherein:

the additional reference is a media object identified by comparing the composite reference information to ~~object~~ information ~~for~~ <u>pertaining to the feature for each respective one of the plurality of</u> media objects.

16.   The method of claim 14, further comprising:

comparing the revised composite reference information to ~~object~~ information for <u>the feature for each of a second plurality of</u> media objects in the collection of media objects.

17.   The method of claim 1, wherein:

comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects includes assigning a similarity value to each <u>respective one</u> of the media objects in the collection of media objects, ~~the~~ <u>each</u> similarity value indicating the similarity of the ~~object~~ <u>information for the media object and</u> ~~to~~ the composite reference information.

18.   The method of claim 17, wherein:

~~the~~ <u>each</u> similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

19.   The method of claim 17, further comprising:

ranking the media objects according to their similarity values; <u>and</u>

~~wherein~~ selecting <u>one or more</u> a media object<u>s</u> in the collection of media objects ~~based upon the comparison of the object information and the composite reference information includes selecting a media object~~ based upon its rank.

20.   The method of claim 8, wherein:

<u>for each reference and media object,</u> the ~~object~~ information <u>pertaining to</u> ~~for each of~~ the <u>feature and the information pertaining to the second feature</u> ~~reference and media objects~~ is expressed as a feature vector of components~~; and~~

~~each feature vector includes one or more components representing a feature of the corresponding reference or media object.~~

21.   The method of claim 20, wherein:

combining ~~object~~ information <u>pertaining to a feature and combining information pertaining to a second feature common to</u> ~~for~~ a plurality of reference objects includes combining the feature vectors of the plurality of reference objects to produce a composite reference vector.

22.   The method of claim 21, wherein:

each feature vector includes one or more components representing metadata associated with the corresponding reference or media object; and

combining ~~object~~ information <u>pertaining to a feature and combining information pertaining to a second feature common to</u> ~~for~~ a plurality of reference objects includes combining components representing a <u>the feature or the second</u> feature ~~of part or all of each reference object~~ according to a first combination function and combining the one or more components representing metadata associated with ~~part or all of~~ each reference object according to a second combination function.

23.   The method of claim 21, further comprising:

defining a weighting vector for <u>the feature and the second feature</u> ~~one or more of the features~~, the weighting vector specifying a relative importance for the corresponding features;

wherein combining the feature vectors includes using the weighting vector to specify a relative importance of the features.

25.   The method of claim 21, wherein:

comparing the composite reference information to ~~object~~ information ~~for~~ <u>pertaining to the same feature for each respective one of a plurality of</u> media objects in a collection of media objects includes comparing the composite reference vector to ~~the~~ <u>a</u> feature vectors of each of ~~a~~ <u>the</u> plurality of media objects in the collection of media objects.

27.   The method of claim 1, wherein:

combining ~~object~~ information ~~for~~ <u>pertaining to a feature common to</u> a plurality of reference objects includes using a combination function;

comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects includes using a comparison function that is based upon the combination function.

28.   ~~The method of claim 1, wherein~~ <u>A method for searching a collection of media objects, comprising</u>:

combining ~~the object~~ information <u>pertaining to two or more features common to a plurality of reference objects to produce composite reference information representing criteria for a search, wherein the information</u> ~~characterizes features of the reference objects and the media objects in the collection of media objects and~~ is expressed as a feature vector of components~~;~~ <u>and</u>

combining ~~object information for a plurality of reference objects~~ includes combining the feature vectors of the plurality of reference objects using a Min or Max function to produce a composite reference vector; <u>and</u>

comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ the media objects in the collection of media objects<u>, wherein comparing</u> includes comparing the composite reference vector to the feature vectors of each media object in the collection of media objects using a Min or Max function and assigning a similarity value to each media object in the collection of media objects, the similarity value indicating the similarity of the feature vector of the media object to the composite reference vector, where the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

29.   A computer program product on a computer-readable medium, for searching a collection of media objects, the computer program comprising instructions operable to cause a programmable processor to:

combine ~~object~~ information pertaining to a feature common to ~~for~~ a plurality of reference objects to produce composite reference information representing criteria for a search;

compare the composite reference information to ~~object~~ information pertaining to the same feature for each respective one of a plurality of ~~for~~ media objects in a collection of media objects to identify one or more media objects ~~in the collection of media objects~~;

wherein a non-Euclidian function is used either to combine the information pertaining to the feature, or to compare the composite reference information to information pertaining to the same feature.

31.   The computer program product of claim 29, further comprising instructions operable to cause a programmable processor to:

select a media object in the collection of media objects based upon the comparison of the ~~object~~ information pertaining to the feature for each media object and the composite reference information.

33.   The computer program product of claim 32, wherein:

instructions to combine ~~object~~ information pertaining to a feature common to ~~for~~ a plurality of reference objects include instructions to combine ~~object~~ information for different types of objects.

34.   The computer program product of claim 29, wherein:

instructions to combine ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information include instructions to determine the intersection of the ~~object~~ information for the reference objects.

35.   The computer program product of claim 29, wherein:

instructions to combine object information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information include instructions to determine the union of the ~~object~~ information for the reference objects.

36.   The computer program product of claim 29, ~~wherein~~ <u>further comprising</u>:

<u>instructions to combine</u> ~~the object~~ information <u>pertaining to a second feature common to the plurality of reference objects to produce additional composite reference information representing criteria for the search; and</u> ~~characterizes two or more features of the reference objects and the media objects in the collection of media objects.~~

<u>instructions to compare the additional composite reference information to information pertaining to the second feature for each respective one of the plurality of media objects in the collection of media objects to identify one or more media objects.</u>

37.   The computer program product of claim 36, wherein:

the ~~object~~ information <u>pertaining to a feature and the information pertaining to a second feature</u> is weighted to specify a relative importance of the features.

38.   The computer program product of claim 36, further comprising instructions operable to cause a programmable processor to:

receive user input indicating the relative importance of the features and the second feature.

39.   The computer program product of claim 36, wherein:

at least one the feature and the second feature are each is represented by the a relative frequency of occurrence of a feature value each of several values for the feature.

40.   The computer program product of claim 36, wherein:

information pertaining to the feature and information pertaining to the second feature the set of features includes color information describing the relative frequency of occurrence of colors in an object.

41.   The computer program product of claim 36, wherein:

a information pertaining to the feature for a first object type is mapped to a information pertaining to the second feature for a second object type.

42.   The computer program product of claim 29, further comprising instructions operable to cause a programmable processor to:

combine object information pertaining to the feature for an additional reference object with the composite reference information to revise the composite reference information.

43.   The computer program product of claim 42, wherein:

the additional reference is a media object identified by comparing the composite reference information to ~~object~~ information <u>pertaining to the feature for each respective one of the plurality of</u> ~~for~~ media objects.

44.   The computer program product of claim 42, further comprising instructions operable to cause a programmable processor to:

compare the revised composite reference information to ~~object~~ information for <u>the feature for each of a second plurality of</u> media objects in the collection of media objects.

45.   The computer program product of claim 29, wherein:

instructions to compare the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects include instructions to assign a similarity value to each <u>respective one</u> of the media objects in the collection of media objects, ~~the~~ <u>each</u> similarity value indicating the similarity of the ~~object~~ <u>information for the media object and</u> ~~to~~ the composite reference information.

46.   The computer program product of claim 45, wherein:

~~the~~ <u>each</u> similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

47.	The computer program product of claim 45, further comprising instructions operable to cause a programmable processor to:

rank the media objects according to their similarity values; and

wherein instructions to select one or more a media objects in the collection of media objects based upon the comparison of the object information and the composite reference information include instructions to select a media object based upon its rank.

48.	The computer program product claim 36, wherein:

for each reference and media object, the object information pertaining to for each of the feature and the information pertaining to the second feature reference and media objects is expressed as a feature vector of components ; and

each feature vector includes one or more components representing a feature of the corresponding reference or media object.

49.	The computer program product of claim 48, wherein:

instructions to combine object information pertaining to a feature and instructions to combine information pertaining to a second feature common to for a plurality of reference objects include instructions to combine the feature vectors of the plurality of reference objects to produce a composite reference vector.

50.   The computer program product of claim 49, wherein:

each feature vector includes one or more components representing metadata associated with the corresponding reference or media object; and

combining ~~object~~ information <u>pertaining to a feature and combining information pertaining to a second feature common to</u> ~~for~~ a plurality of reference objects includes combining components representing ~~a~~ <u>the feature or the second</u> feature ~~of part or all of each reference object~~ according to a first combination function and combining the one or more components representing metadata associated with ~~part or all of~~ each reference object according to a second combination function.

51.   The computer program product of claim 49, further comprising instructions operable to cause a programmable processor to:

define a weighting vector for <u>the feature and the second feature</u> ~~one or more of the features~~, the weighting vector specifying a relative importance for the corresponding features;

wherein instructions to combine the feature vectors include instructions to use the weighting vector to specify a relative importance of the features.

53.   The computer program product of claim 49, wherein:

instructions to compare the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects include instructions to compare the composite reference <u>vector</u> to ~~the~~ <u>a</u> feature vectors of each of ~~a~~ <u>the</u> plurality of media objects in the collection of media objects.

55.   The computer program product of claim 29, wherein:

instructions to combine ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects include instructions to use a combination function;

instructions to compare the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects include instructions to use a comparison function that is based on the combination function.

56.   <u>A computer program product on a computer-readable medium, for searching a collection of media objects, the computer program comprising instructions operable to cause a programmable processor to</u> ~~The computer program product of claim 29, wherein~~:

combine ~~the object~~ information <u>pertaining to two or more features common to a plurality of reference objects to produce composite reference information representing criteria for a search, wherein the information</u> ~~characterizes features of the reference objects and the media objects in the collection of media objects and~~ is expressed as a feature vector of components~~;~~ <u>and</u>

<u>the instructions to</u> combine ~~ing object information for a plurality of reference objects~~ includes <u>instructions to</u> combin~~ing~~ the feature vectors of the plurality of reference objects using a Min or Max function to produce a composite reference vector; <u>and</u>

compar~~ing~~ the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ the media objects in the collection of media objects includes comparing the composite reference vector to the feature vectors of each media object in the collection of media objects using a Min or Max function and assigning a similarity value to each media object in the collection of media objects, the similarity value indicating the similarity of the feature vector of the media object to the composite reference vector, where the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

57.   A system for searching a collection of media objects, comprising:

means for combining ~~object~~ information <u>pertaining to a feature common to</u> ~~for~~ a plurality of reference objects to produce composite reference information representing criteria for a search; ~~and~~

means for comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects to identify one or more media objects ~~in the collection of media objects~~;

<u>wherein a non-Euclidian function is used either to combine the information pertaining to the feature, or to compare the composite reference information to information pertaining to the same feature.</u>

58.   The system of claim 57, wherein:

means for comparing the composite reference information to ~~object~~ information <u>pertaining to the same feature for each respective one of a plurality of</u> ~~for~~ media objects in the collection of media objects includes means for assigning a similarity value to each <u>respective one</u> of the media objects in the collection of media objects, <u>each</u> ~~the~~ similarity value indicating the similarity of the ~~object~~ <u>information for the media object and</u> ~~to~~ the composite reference information, wherein the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

59.   A system for searching a collection of media objects, comprising ~~The system of claim 57, wherein~~:

means for combining ~~the object~~ information <u>pertaining to two or more features common to a plurality of reference objects to produce composite reference information representing criteria for a search, wherein the information</u> ~~characterizes features of the reference objects and the media objects in the collection of media objects and~~ is expressed as a feature vector of components~~;~~

~~means for combining object information for a plurality of reference objects~~ <u>and means for combining</u> includes means for combining the feature vectors of the plurality of reference objects to produce a composite reference vector; and

means for comparing the composite reference information to ~~object~~ information <u>pertaining to the same two or more features for each respective one of a plurality of</u> ~~for~~ media objects in a collection of media objects<u>, wherein the means for comparing</u> includes means for comparing the composite reference vector to the feature vectors of each of the media objects in the collection of media objects.

Please also replace the existing abstract with the following abstract:

Methods and apparatus implementing a technique for searching media objects. In general, in one aspect, the technique includes receiving user input specifying a plurality of reference objects, defining a feature common to them, and combining information pertaining to the feature to generate composite reference information defining criteria for a search. The technique includes comparing the composite reference information to information pertaining to the same feature for each media object in a collection of media objects, and selecting a media object based upon the comparison. A non-Euclidean function is used either to combine or compare the information pertaining to the feature.

Remarks

The applicant has amended claims 1, 3, 5-23, 25, 27-29, 31, 33-51, 53, and 55-59, and the abstract.

Independent claims 1, 29 and 57 are amended to more clearly indicate that the recited combining and comparing of information is combining and comparing of information pertaining to a feature that is common to a plurality of reference media objects and which occurs in each respective one of a plurality of media objects in a collection of media objects. Independent claims 1, 29 and 57 are also amended to specify that a non-Euclidian function is used either to combine or compare the information pertaining to the feature.

Claims 3, 5-7, 14-17, 20, 25, 27; 31, 33-35, 42-45, 48, 53, 55; and 58 depend on claims 1, 29, and 57, respectively, and each is amended in the same was as the respective independent claim.

Claims 8, 36, and 59 are amended to reflect the more clear language of amended claims 1, 29, or 57, respectively, and are also amended to explicitly recite combining and comparing a feature and a second feature, rather than simply reciting "features". Claims 9-13, 16, 20-23, and 28; and claims 37-41, 44, 48-51, and 56 depend from claims 8 and 36, respectively, and are amended in accordance with the amendments to claims 8 and 36.
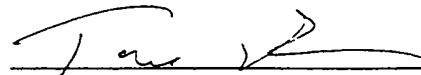
Claims 11, 13, 17-18, 19, 22, 25; and 39, 41, 45-47, 50, 53 are amended to correct and clarify the language of the claims. The abstract is amended to reflect the changes to claim 1.

Attached are replacement pages 41 through 56 reflecting the above amendments.

Please apply any charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: Feb 11, 2004

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What is claimed is:

1.   A method for searching a collection of media objects, comprising:

combining information pertaining to a feature common to a plurality of reference
5   objects to produce composite reference information representing criteria for a search; and

comparing the composite reference information to information pertaining to the
same feature for each respective one of a plurality of media objects in a collection of
media objects to identify one or more media objects;

wherein a non-Euclidian function is used either to combine the information
10   pertaining to the feature, or to compare the composite reference information to information
pertaining to the same feature.

2.   The method of claim 1, further comprising:

receiving user input specifying the plurality of reference objects.

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3.   The method of claim 1, further comprising:

selecting a media object in the collection of media objects based upon the
comparison of the information pertaining to the feature for each media object and the
composite reference information.

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4.   The method of claim 1, wherein:

the plurality of reference objects includes one or more objects having a type
selected from: audio, image, text, CD, or video.

5. The method of claim 4, wherein:

combining information pertaining to a feature common to a plurality of reference objects includes combining information for different types of objects.

5   6. The method of claim 1, wherein:

combining information pertaining to a feature common to a plurality of reference objects to produce composite reference information includes determining the intersection of the information for the reference objects.

10   7. The method of claim 1, wherein:

combining information pertaining to a feature common to a plurality of reference objects to produce composite reference information includes determining the union of the information for the reference objects.

15   8. The method of claim 1, further comprising:

combining information pertaining to a second feature common to the plurality of reference objects to produce additional composite reference information representing criteria for the search; and

comparing the additional composite reference information to information
20   pertaining to the second feature for each respective one of the plurality of media objects in the collection of media objects to identify one or more media objects.

9. The method of claim 8, wherein:

the information pertaining to a feature and the information pertaining to a second
25   feature is weighted to specify a relative importance of the features.

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10. The method of claim 8, further comprising:

receiving user input indicating the relative importance of the feature and the second feature.

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11. The method of claim 8, wherein:

the feature and the second feature are each represented by a relative frequency of occurrence of a feature value.

10   12. The method of claim 8, wherein:

information pertaining to the feature and information pertaining to the second feature includes color information describing the relative frequency of occurrence of colors in an object.

15   13. The method of claim 8, wherein:

information pertaining to the feature is mapped to information pertaining to the second feature.

14. The method of claim 1, further comprising:

20   combining information pertaining to the feature for an additional reference object with the composite reference information to revise the composite reference information.

15.   The method of claim 14, wherein:

the additional reference is a media object identified by comparing the composite reference information to information pertaining to the feature for each respective one of the plurality of media objects.

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16.   The method of claim 14, further comprising:

comparing the revised composite reference information to information for the feature for each of a second plurality of media objects in the collection of media objects.

10   17.   The method of claim 1, wherein:

comparing the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects includes assigning a similarity value to each respective one of the media objects in the collection of media objects, each similarity value indicating the similarity of

15   the information for the media object and the composite reference information.

18.   The method of claim 17, wherein:

each similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

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19.   The method of claim 17, further comprising:

ranking the media objects according to their similarity values; and

selecting one or more media objects in the collection of media objects based upon its rank.

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20.   The method of claim 8, wherein:

for each reference and media object, the information pertaining to the feature and the information pertaining to the second feature is expressed as a feature vector of components.

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21.   The method of claim 20, wherein:

combining information pertaining to a feature and combining information pertaining to a second feature common to a plurality of reference objects includes combining the feature vectors of the plurality of reference objects to produce a composite reference vector.

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22.   The method of claim 21, wherein:

each feature vector includes one or more components representing metadata associated with the corresponding reference or media object; and

15   combining information pertaining to a feature and combining information pertaining to a second feature common to a plurality of reference objects includes combining components representing the feature or the second feature according to a first combination function and combining the one or more components representing metadata associated with each reference object according to a second combination function.

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23.   The method of claim 21, further comprising:

defining a weighting vector for the feature and the second feature, the weighting vector specifying a relative importance for the corresponding features;

wherein combining the feature vectors includes using the weighting vector to specify a relative importance of the features.

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24.   The method of claim 21, wherein:

combining the feature vectors includes using a Min or Max function.

25.   The method of claim 21, wherein:

5   comparing the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects includes comparing the composite reference vector to a feature vector of each of the plurality of media objects in the collection of media objects.

10   26.   The method of claim 25, wherein:

comparing the composite reference vector to the feature vectors of each of a plurality of media objects includes using a Min or Max function.

27.   The method of claim 1, wherein:

15   combining information pertaining to a feature common to a plurality of reference objects includes using a combination function;

comparing the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects includes using a comparison function that is based upon the combination
20   function.

28.   A method for searching a collection of media objects, comprising:

combining information pertaining to two or more features common to a plurality of reference objects to produce composite reference information representing criteria for a search, wherein the information is expressed as a feature vector of components and

5   combining includes combining the feature vectors of the plurality of reference objects using a Min or Max function to produce a composite reference vector; and

comparing the composite reference information to information pertaining to the same feature for each respective one of a plurality of the media objects in the collection of media objects, wherein comparing includes comparing the composite reference vector to

10   the feature vectors of each media object in the collection of media objects using a Min or Max function and assigning a similarity value to each media object in the collection of media objects, the similarity value indicating the similarity of the feature vector of the media object to the composite reference vector, where the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value

15   calculated for each reference object.

29.   A computer program product on a computer-readable medium, for searching a collection of media objects, the computer program comprising instructions operable to cause a programmable processor to:

20   combine information pertaining to a feature common to a plurality of reference objects to produce composite reference information representing criteria for a search;

compare the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects to identify one or more media objects;

25   wherein a non-Euclidian function is used either to combine the information pertaining to the feature, or to compare the composite reference information to information pertaining to the same feature.

30.   The computer program product of claim 29, further comprising instructions operable to cause a programmable processor to:

receive user input specifying the plurality of reference objects.

5   31.   The computer program product of claim 29, further comprising instructions operable to cause a programmable processor to:

select a media object in the collection of media objects based upon the comparison of the information pertaining to the feature for each media object and the composite reference information.

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32.   The computer program product of claim 29, wherein:

the plurality of reference objects includes one or more objects having a type selected from: audio, image, text, CD, or video.

15   33.   The computer program product of claim 32, wherein:

instructions to combine information pertaining to a feature common to a plurality of reference objects include instructions to combine information for different types of objects.

20   34.   The computer program product of claim 29, wherein:

instructions to combine information pertaining to a feature common to a plurality of reference objects to produce composite reference information include instructions to determine the intersection of the information for the reference objects.

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35.   The computer program product of claim 29, wherein:

instructions to combine object information pertaining to a feature common to a plurality of reference objects to produce composite reference information include instructions to determine the union of the information for the reference objects.

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36.   The computer program product of claim 29, further comprising:

instructions to combine information pertaining to a second feature common to the plurality of reference objects to produce additional composite reference information representing criteria for the search; and

10   instructions to compare the additional composite reference information to information pertaining to the second feature for each respective one of the plurality of media objects in the collection of media objects to identify one or more media objects.

37.   The computer program product of claim 36, wherein:

15   the information pertaining to a feature and the information pertaining to a second feature is weighted to specify a relative importance of the features.

38.   The computer program product of claim 36, further comprising instructions operable to cause a programmable processor to:

20   receive user input indicating the relative importance of the feature and the second feature.

39.   The computer program product of claim 36, wherein:

the feature and the second feature are each represented by a relative frequency of

25   occurrence of a feature value.

40. The computer program product of claim 36, wherein:

information pertaining to the feature and information pertaining to the second feature includes color information describing the relative frequency of occurrence of colors in an object.

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41. The computer program product of claim 36, wherein:

information pertaining to the feature is mapped to information pertaining to the second feature.

10   42. The computer program product of claim 29, further comprising instructions operable to cause a programmable processor to:

combine information pertaining to the feature for an additional reference object with the composite reference information to revise the composite reference information.

15   43. The computer program product of claim 42, wherein:

the additional reference is a media object identified by comparing the composite reference information to information pertaining to the feature for each respective one of the plurality of media objects.

20   44. The computer program product of claim 42, further comprising instructions operable to cause a programmable processor to:

compare the revised composite reference information to information for the feature for each of a second plurality of media objects in the collection of media objects.

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45.   The computer program product of claim 29, wherein:

instructions to compare the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects include instructions to assign a similarity value to each

5   respective one of the media objects in the collection of media objects, each similarity value indicating the similarity of the information for the media object and the composite reference information.

46.   The computer program product of claim 45, wherein:

10   each similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

47.   The computer program product of claim 45, further comprising instructions operable to cause a programmable processor to:

15   rank the media objects according to their similarity values; and

select one or more media objects in the collection of media objects based upon its rank.

48.   The computer program product claim 36, wherein:

for each reference and media object, the information pertaining to the feature and

20   the information pertaining to the second feature is expressed as a feature vector of components.

49. The computer program product of claim 48, wherein:

instructions to combine information pertaining to a feature and instructions to combine information pertaining to a second feature common to a plurality of reference objects include instructions to combine the feature vectors of the plurality of reference objects to produce a composite reference vector.

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50. The computer program product of claim 49, wherein:

each feature vector includes one or more components representing metadata associated with the corresponding reference or media object; and

10 combining information pertaining to a feature and combining information pertaining to a second feature common to a plurality of reference objects includes combining components representing the feature or the second feature according to a first combination function and combining the one or more components representing metadata associated with each reference object according to a second combination function.

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51. The computer program product of claim 49, further comprising instructions operable to cause a programmable processor to:

define a weighting vector for the feature and the second feature, the weighting vector specifying a relative importance for the corresponding features;

20 wherein instructions to combine the feature vectors include instructions to use the weighting vector to specify a relative importance of the features.

52. The computer program product of claim 49, wherein:

instructions to combine the feature vectors include instructions to use a Min or Max
25 function.

53. The computer program product of claim 49, wherein:

instructions to compare the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects include instructions to compare the composite reference vector

5   to a feature vector of each of the plurality of media objects in the collection of media objects.

54. The computer program product of claim 53, wherein:

instructions to compare the composite reference vector of the reference object to

10 the feature vectors of each of a plurality of media objects include instructions to use a Min or Max function.

55. The computer program product of claim 29, wherein:

instructions to combine information pertaining to a feature common to a plurality

15 of reference objects include instructions to use a combination function;

instructions to compare the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects include instructions to use a comparison function that is based on the combination function.

20

56.   A computer program product on a computer-readable medium, for searching a collection of media objects, the computer program comprising instructions operable to cause a programmable processor to:

combine information pertaining to two or more features common to a plurality of

5   reference objects to produce composite reference information representing criteria for a search, wherein the information is expressed as a feature vector of components and the instructions to combine include instructions to combine the feature vectors of the plurality of reference objects using a Min or Max function to produce a composite reference vector; and

10   compare the composite reference information to information pertaining to the same feature for each respective one of a plurality of the media objects in the collection of media objects includes comparing the composite reference vector to the feature vectors of each media object in the collection of media objects using a Min or Max function and assigning a similarity value to each media object in the collection of media objects, the similarity

15   value indicating the similarity of the feature vector of the media object to the composite reference vector, where the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

20   57.   A system for searching a collection of media objects, comprising:

means for combining information pertaining to a feature common to a plurality of reference objects to produce composite reference information representing criteria for a search;

means for comparing the composite reference information to information

25   pertaining to the same feature for each respective one of a plurality of media objects in a collection of media objects to identify one or more media objects;

wherein a non-Euclidian function is used either to combine the information pertaining to the feature, or to compare the composite reference information to information pertaining to the same feature.

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58.   The system of claim 57, wherein:

means for comparing the composite reference information to information pertaining to the same feature for each respective one of a plurality of media objects in the collection of media objects includes means for assigning a similarity value to each

5   respective one of the media objects in the collection of media objects, each similarity value indicating the similarity of the information for the media object and the composite reference information, wherein the similarity value of each of the media objects in the collection of media objects is less than or equal to a similarity value calculated for each reference object.

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59.   A system for searching a collection of media objects, comprising:

means for combining information pertaining to two or more features common to a plurality of reference objects to produce composite reference information representing criteria for a search, wherein the information is expressed as a feature vector of

15   components and means for combining includes means for combining the feature vectors of the plurality of reference objects to produce a composite reference vector; and

means for comparing the composite reference information to information pertaining to the same two or more features for each respective one of a plurality of media objects in a collection of media objects, wherein the means for comparing includes means

20   for comparing the composite reference vector to the feature vectors of each of the media objects in the collection of media objects.

REDUCTION OF SEARCH AMBIGUITY WITH MULTIPLE MEDIA REFERENCES

ABSTRACT OF THE DISCLOSURE

Methods and apparatus implementing a technique for searching media objects. In general, in one aspect, the technique includes receiving user input specifying a plurality of reference objects (2), defining a feature common to them, and combining information pertaining to the feature to generate composite reference information (4) defining criteria for a search . The technique includes comparing the composite reference information to information pertaining to the same feature for each media object in a collection of media objects (10), and selecting a media object based upon the comparison (16). A non-Euclidean function is used either to combine or compare the information pertaining to the feature.